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**Completion Report**

**See Reference**

**Fig # 1 See (SDMS Doc # 232891)**  
**Fig # 2 See (SDMS Doc # 231467)**  
**Fig # 3 See (SDMS Doc # 231467)**  
**Fig # 5 See (SDMS Doc # 232860)**  
**Fig # 6 See (SDMS Doc # 232860)**  
**Fig # 7 See (SDMS Doc # 232860)**  
**Fig # 9 See (SDMS Doc # 232891)**

**All Appendix Docs**

**See (SDMS Doc # 232875)**



STS CONSULTANTS

**STS CONSULTANTS, LTD.**



**Completion Report  
Time-Critical Removal Action  
Lindsay Light II Site/  
(OU3/North McClurg Court)  
341 East Ohio Street  
Chicago, Illinois**

Teachers' Retirement System of the  
State of Illinois

STS Project No. 1-25585-XJ  
December 31, 2002  
Revision Two March 26, 2003

### **AFFADAVIT**

Under penalty of law, I certify that, to the best of my knowledge, after appropriate inquiries of all relevant persons involved in the preparation of this report, the information submitted is true, accurate, and complete.

---

Richard G. Berggreen, C.P.G.  
Principal Geologist

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Date



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Teachers' Retirement System of the State of Illinois  
STS Project No. 1-25585-XJ  
December 31, 2002, Revision Two March 26, 2003

**COMPLETION REPORT  
TIME-CRITICAL REMOVAL ACTION  
LINDSAY LIGHT II SITE/(OU3/NORTH MCCLURG COURT)  
341 EAST OHIO STREET  
CHICAGO, ILLINOIS**

## **1.0 INTRODUCTION**

### **1.1 Purpose and Background**

This Completion Report has been prepared by STS Consultants, Ltd. (STS) and is submitted to the U.S. Environmental Protection Agency (USEPA) to document a time-critical removal action (Removal Action) that has been performed at a vacant site comprising 2.16 acres located at 341 East Ohio Street, Chicago, Illinois (Subject Site) which has previously been acquired by Teachers' Retirement System of the State of Illinois (TRS) by deeds in lieu of foreclosure. The Removal Action has been performed in response to requirements in the Unilateral Administrative Order dated June 6, 1996, as amended by First Amendment dated March 29, 2000 (UAO), issued by USEPA pursuant to Section 106 of the Comprehensive Environmental Response, Compensation and Liability Act, as amended (CERCLA), in the administrative proceeding pending as *In the Matter of Lindsay Light II Site, Chicago, Illinois*, Docket No. V-W-96-C-353. The UAO was issued initially by USEPA on June 6, 1996 to The Chicago Dock and Canal Trust (to which River East, LLC [River East] is the successor) and Kerr-McGee Chemical Corporation (to which Kerr-McGee Chemical, LLC [Kerr-McGee] is the successor) with respect to property located at 316 East Illinois Street, Chicago, Illinois and referred to in the UAO as the Lindsay Light II Site. USEPA subsequently amended the UAO by First Amendment dated March 29, 2000 to add Grand Pier Center L.L.C. as a respondent and to require removal action at the site located across Columbus Drive from the Lindsay Light II Site and referred to by USEPA as Lindsay Light II/(RV3 North Columbus Drive). The UAO also required the respondents to perform removal action on areas that were off-site from Lindsay Light II and Lindsay Light II/(RV3 North Columbus Drive) if the contamination subject to the UAO was discovered in such off-site areas.

TRS previously held mortgage loans secured by the Subject Site and, following defaults under such mortgage loans, acquired the Subject Site by deeds in lieu of foreclosure. As such, TRS believes that it is a secured creditor for purposes of CERCLA and is therefore exempt from owner/operator liability under CERCLA. TRS has entered into a contract to sell the Subject Site to a third party purchaser, which engaged environmental consultants to perform environmental investigation of the Subject Site. In May, 2000 those investigations identified radiological contamination on the Subject Site which TRS promptly



reported to USEPA. USEPA subsequently issued an Action Memorandum Amendment dated March 1, 2001 with respect to the Subject Site pursuant to which USEPA determined that (a) the radiological impacts at the Subject Site are associated with the former operations of Lindsay Light Company and (b) the UAO requires Kerr-McGee to proceed with removal action with respect to the contamination at the Subject Site. USEPA has designated the Subject Site as the Lindsay Light II Site/(OU3/North McClurg Court). TRS made demand on Kerr-McGee to perform the Removal Action at the Subject Site. In order to resolve disagreements between TRS and Kerr-McGee concerning the Removal Action, TRS and Kerr-McGee entered into an agreement providing for, among other things, (i) TRS to perform excavation and radiological screening on the Subject Site, (ii) Kerr-McGee to transport and dispose of radiologically-impacted materials removed from the Subject Site, and (iii) each of TRS and Kerr-McGee to reserve its rights to recover its costs from the other party or from third parties, as applicable. This Report documents the Removal Action performed on the Subject Site pursuant to such arrangements.

Copies of the UAO and the Action Memorandum Amendment dated March 1, 2001 are included in this Report as Appendix A.

## **1.2 Work Plan**

The work was completed in accordance with the specifications presented in a Removal Action Work Plan, as amended, comprised of the documents listed in Appendix B (Work Plan). Appendix B also includes copies of the documents comprising the Work Plan in the final form that has been approved by USEPA. The Work Plan initially provided to USEPA for review and approval was dated May 1, 2001. Approval of that Work Plan was received in correspondence from USEPA dated September 12, 2001. Various components of that Work Plan were subsequently amended and resubmitted to USEPA as described in Appendix B. USEPA's approval of the Work Plan was evidenced by various letters from USEPA that are listed and included in Appendix B. In its letter dated May 15, 2002, USEPA stated, among other things, that the Work Plan is consistent with the UAO.

## **1.3 Location and Description of Subject Site**

The Subject Site, located at 341 East Ohio Street, Chicago, Illinois, is bounded on the north by East Ohio Street, on the east by North McClurg Court, on the south by East Grand Avenue and on the west by the Time-Life Building, 541 North Fairbanks Street. The Subject Site is located in the southeast ¼ of the northwest ¼ of Section 10, Township 39 North, Range 14 East on the Chicago Loop, Illinois US Geological Survey 7.5 Minute Topographic Quadrangle map, Latitude 41 degrees, 53 minutes 35

seconds North, Longitude 87 degrees 37 minutes, 25 seconds West. A location map is provided as Figure 1.

The Subject Site was sub-divided into a 5-meter by 5-meter grid to aid with guiding and documenting the field work and observations performed pursuant to the Work Plan. Grid boxes were labeled A to N from south to north and 1 to 27 from west to east. Grid A-1 was in the southwest corner of the Subject Site and Grid N-27 was located at the northeast corner of the Subject Site. Figure 2 presents a site plan showing such grid on the Subject Site.

#### **1.4 Hazardous Substances Addressed**

The hazardous substances that were removed as documented in this Completion Report include thorium and the related radioactive progeny decay products, uranium and the related radioactive progeny decay products, and the pesticide chlordane and other pesticide compounds. The thorium chain decay progeny are represented in the cleanup standard using the element radium-228. The uranium chain decay progeny are represented in the cleanup standard using the element radium-226. The suite of pesticides included the following list of compounds detected in samples from the Subject Site.

#### **Detected Pesticides**

Chlordane (Tech.)	Aldrin
Beta-BHC	Delta-BHC
Gamma-BHC (Lindane)	Alpha-Chlordane
Gamma-Chlordane	4,4'-DDD
4,4'-DDE	4,4'-DDT
Dieldrin	Endrin
Endrin ketone	Heptachlor
Heptachlor epoxide	Endosulfan I
Endosulfan II	Endrin Aldehyde
Methoxychlor	

#### **1.5 Subject Site History**

The radiologically-impacted materials on the Subject Site and several vicinity properties have been attributed to historical operations by the Lindsay Light and Chemical Company, whose principal manufacturing facility in the area was formerly located at 161 East Grand Avenue, Chicago, Illinois,

approximately two blocks west of the Subject Site. In addition, Lindsay Light and Chemical Company processed monazite ore for extraction of thorium at the Lindsay Light II Site which is immediately to the south of, and across East Grand Avenue from, the Subject Site. Those operations occurred at the former Lindsay Light and Chemical Company facilities during the time period from 1915 to 1936, approximately.

The pesticide-impacted materials on the Subject Site are attributed to operations by Velsicol Chemical Company (Velsicol), which operated on the Subject Site from approximately 1917 to 1988. Sandoz Crop Protection Corp. (Sandoz), which purchased certain business operations of Velsicol in approximately 1986, also may have operated on the Subject Property between 1986 and 1988, and some of the pesticide-impacted materials at the Subject Site may be attributed to Sandoz's operations. The Velsicol/Sandoz operations included a pesticide research and development facility including a pesticide testing laboratory. Figure 3 shows the locations of the buildings on the Subject Site in 1988. The Velsicol/Sandoz facility was decommissioned and the buildings razed in 1988 and 1989, after which the Subject Site was paved for use as a surface parking lot. The asphalt parking surface remained on the Subject Site continuously from the time of TRS' acquisition of the Subject Site by deeds in lieu of foreclosure until the excavation work for the Removal Action was commenced in June, 2002.

The Subject Site was investigated in 2000 as part of a due diligence property assessment by a third party purchaser with whom TRS had entered into a contract to sell the Subject Site. The investigation included gamma radiation measurements and subsurface sampling for radioactivity. Elevated gamma radiation was detected at several locations on the Subject Site, as reported in a report by B. Koh & Associates, Inc. (Koh) dated May 2000. Figure 4 shows the radiologically impacted areas identified in the Koh report. On the basis of that report, TRS made demands on Kerr-McGee to remove the contamination from the Subject Site, and thereafter TRS and Kerr-McGee entered into the agreement referred to above pursuant to which the Removal Action has been performed. The principal objectives of the Removal Action have been to remove the radiologically-impacted materials and pesticide-impacted materials from the Subject Site to meet applicable USEPA-specified cleanup standards set forth in the Work Plan. The Work Plan did not specifically address radiologically-impacted materials located outside of the boundaries of the Subject Site under the immediately adjacent City of Chicago's sidewalk right-of-way and, as a result, radiologically-impacted materials remain under the adjacent sidewalks. On the basis of this report, TRS requests that USEPA issue a Notice of Completion pursuant to Article XII of the UAO confirming that (a) all radiologically-impacted materials and pesticide-impacted materials with levels of radioactivity and pesticides in excess of the cleanup standards set forth in the Work Plan have been removed from the Subject Site as required by the Work Plan and the UAO, (b) no further investigation, removal or cleanup action is required at the Subject Site with respect to radiologically-impacted materials and pesticide-

impacted materials and (c) construction and development work on the Subject Site may proceed without further regulatory requirements relating to radiological impacts or pesticide impacts.

The excavation work for the Removal Action commenced on June 6, 2002 and was completed on October 4, 2002, after which the equipment was demobilized from the Subject Site. Restoration work with respect to the Subject Site was completed on December 12, 2002 and included rough grading, installation of a gravel cover and installation of a perimeter fence.

### **1.6 Organization of This Completion Report**

Section 1.0 of this Report consists of the introduction and brief narrative history of the project. Section 2 describes the Removal Action, including the radiological and pesticide removals, the verification surveys and testing, and USEPA-approved revisions to the Work Plan that were made during the course of the project. Section 3 documents the volumes of materials removed. Section 4 describes difficulties encountered during the field work, and the manner in which those issues were resolved. Section 5 presents the analytical results for the various media tested, including the radiological and pesticide testing of the soil, the air monitoring results and the personnel monitoring conducted in the course of the project. Section 6 presents the conclusions and requests USEPA to issue a Notice of Completion indicating that the Removal Action has been completed in accordance with the Work Plan and the UAO, no radiological or pesticide impacted material remains on the Subject Site in excess of the cleanup criteria stipulated in the Work Plan, and there are no restrictions on usage of the Subject Site based on the radiological and pesticide levels. Again, as referenced previously, while TRS has fully satisfied its obligations under the Work Plan and no radiological or pesticide impacted material remains within the boundaries of the subject site, there are, however, remaining radiologically-impacted materials beneath the immediately adjacent sidewalks and there are restrictions on the access to those materials during the installation and maintenance of utilities and other activities which may expose the impacted subsurface soils.

### **1.7 Resources Utilized to Complete the Removal Action**

To date, TRS has incurred nearly \$3 million in the completion of the Removal Action at the Subject Site. Additional costs may be incurred. Note that these costs do not include costs for transportation and disposal of radiologically-impacted soils provided through Kerr-McGee Chemical LLC and EnviroCare of Utah.

## **2.0 REMOVAL ACTION**

### **2.1 Perimeter Drilling Program**

A drilling and gamma-logging program was completed around the perimeter of the north, east and south sides of the Subject Site prior to the commencement of the excavation work for the Removal Action. The objective of the perimeter drilling program was to document the presence or absence of radiological impacts in the soil within a wedge-shaped volume of soil sloping from the property line into the Subject Site at a 1 vertical to 1.5 horizontal slope. This wedge of material was proposed to remain in place, if not impacted above the clean-up criteria, so as to allow excavation of the remainder of the interior of the Subject Site without requiring an earth retention system around the perimeter of the Subject Site to protect adjacent sidewalks and streets from the risk of collapse. The perimeter drilling did not occur on the west side of the Subject Site because the Time-Life Building abuts the west side and provided sufficient lateral support so that excavation could occur to native soils all the way to the property line on the west side of the Subject Site.

The perimeter drilling program was completed and the results documented in a report dated January 16, 2002 prepared by STS and submitted to USEPA. The program consisted of approximately 380 borings on a 2-meter grid around the south, east and north perimeters of the Subject Site. Several small, shallow radiologically-impacted areas were identified in the drilling and logging program. Their locations, depths, and sizes were such that the removal could be facilitated by localized excavation without requiring support along the perimeter of the Subject Site. USEPA approved the results of the program and, as a result, did not require excavation of the wedge of material along the perimeter of the Subject Site, except at those locations where radiologically-impacted materials were evident.

A utility vault was located within the wedge of soil along the south perimeter of the Subject Site. During site soil removal, the vault walls were removed, the soil surveyed and the vault backfilled. The vault was found to hold an out-of-service water valve.

### **2.2 Work Documented Through Daily Reports, Weekly and Monthly Progress Reports**

Section 2 of this Completion Report describes the general progress of the removal operations. Daily field reports were prepared by the Field Team Leader and documented the daily operations, the areas worked, personnel and equipment on the Subject Site and progress made daily. These daily field reports are maintained in the project files. Additionally, weekly and monthly field reports were prepared by the Project Manager and Project Coordinator for submittal to USEPA to provide documentation of the work

completed on a weekly and monthly basis, and to provide a plan for what was to be completed in the coming week or month. These reports were provided to USEPA, and copies are maintained in the project files.

### **2.3 Subdivision of Subject Site into Areas 1, 2, 3 and 4**

The excavation work for the Removal Action progressed across the Subject Site in a phased manner. Figure 2 shows how the Subject Site was divided into Areas 1, 2, 3 and 4 pursuant to the Work Plan. Removal activities were to be performed in several phases sequentially over these four Areas. Area 1 included what was anticipated to be the largest quantity of impacted material, based on the previous investigations. It was proposed that, following that removal effort, the remaining Areas, 2, 3 and 4, would be remediated of identified impacts. The proposed sequence of removal was planned to facilitate traffic on the Subject Site as larger and larger areas were disrupted.

### **2.4 Phase I Radiological Removal**

The Phase I removal consisted of the removal of the identified radiological impacted materials. It was anticipated that additional impacted areas might become evident or known areas might show expanded boundaries upon removal of the pavement (which tended to shield the radiation from detection during the surface surveys). Phase I was proposed to remove these identified areas to clean limits, first in Area 1, and then in Areas 2, 3, and 4.

Excavation began in the southwest corner of the Subject Site in Area 1 with the removal of the pavement. Where a building floor slab was present beneath the pavement, the slab was also removed. The surface beneath the pavement or slab was surveyed for elevated radiation, and exclusion zones established around all locations with evidence of radiological impacts above the cleanup level of 7.1 pCi/g total radium. Excavated radiologically-impacted soil was loaded directly into the shipping containers brought by Kerr-McGee onto the Subject Site. No radiologically-impacted material was stockpiled or staged for loading. The containers were closed, sealed, the exteriors surveyed for contamination, and shipping documents were completed before Kerr-McGee transported the containers off the Subject Site for ultimate delivery to the EnviroCare of Utah, Inc. facility in Clive, Utah.

At each location where radiologically-impacted material was removed, an exclusion zone was established. Verification of removal under Phase I was required for every exclusion zone. Figure 5 documents the locations for the Phase I exclusion zones identified, remediated, and for which verification sign-off was received from USEPA.

## **2.5 Pesticide Removal**

It was anticipated before the commencement of the excavation work that the majority of the pesticide impacts were in Area 1. The Work Plan provided that the radiologically-impacted soils (including those containing pesticides) would be excavated from Area 1 first and delivered to Kerr-McGee for disposal at the EnviroCare facility, and then the non-radiological pesticide-impacted soils in Area 1 would be excavated as part of the Phase I excavation work for Area 1. This Phase I excavation work for radiologically-impacted and pesticide-impacted soils was expected to be completed in Area 1 before proceeding with Phase I excavation work in other Areas. However, the pesticide-impacted area was found to extend somewhat farther than inferred from the pre-excavation drilling and sampling program and extended outside Area 1 into Area 2. As a result, it was necessary to excavate radiologically-impacted materials in Area 2 in order to provide for the pesticide removal to proceed in that Area.

The limits of the pesticide impacts were determined based on a combination of field immunoassay analyses and laboratory analyses in accordance with the procedures and protocols set forth in the STS Memorandum dated July 26, 2002 included in Appendix D. USEPA approved the procedures and protocols in that Memorandum by its letter dated July (should be August) 7, 2002 included in Appendix D. The field results were used to define the limits to which the excavation would proceed, both horizontally and vertically. Testing for the pesticides was conducted through a series of test pits and samples along exposed excavation faces and the floors of excavations. Sampling was conducted at approximately 10 meter spacing for this determination. Figure 6 shows the limits of the pesticide-impacted materials and the sampling locations upon which the limits were determined. Figure 6A shows those locations where pesticide impacted soils also included radiological-impacted material. The results of the field immunoassay and laboratory analyses are provided and discussed in Section 5.0 of this Report.

The pesticide removal consisted of excavation, transport and disposal at CID Landfill in Calumet City, Illinois. The impacted soil was loaded into semi-trailer trucks for shipment to the landfill. The trucks were covered prior to leaving the Subject Site. Excavation generally proceeded from the southwest part of the pesticide-impacted area to the east and north.

## **2.6 Phase II Radiological Screening and Removal**

The Phase II radiological screening and verification of the Subject Site addressed the potential radiological impacts to the portions of the Subject Site that had not already been radiologically screened and cleared in connection with the Phase I excavation work. The objectives of the Phase II survey work



were to identify any remaining radiologically-impacted materials so they could be removed from the Subject Site and document that (a) all the fill that remains on Subject Site has been surveyed for radiological materials and (b) no radiological materials remain on the Subject Site in excess of the USEPA-required cleanup criteria of 7.1 pCi/g total radium.

Phase II work consisted of excavating the remaining fill materials, with the exception of the wedge of soil at the perimeter on the north, east and south margins of the Subject Site, and surveying that material in 18-inch lifts. Ultimately, the fill soil was excavated in the 18-inch lifts down to the native sand that underlies the entire Subject Site and was generally encountered at a depth of between 8 and 12 feet below the original grade level of the Subject Site.

Locations where material exceeding the 7.1 pCi/g clean-up level was encountered during the Phase II excavation and screening were designated exclusion zones. USEPA verification was required to document clean-up in each such exclusion zone. Figure 7 shows the locations of the Phase II exclusion zones.

## **2.7 Concrete Rubble Removal**

Concrete rubble was encountered in the course of the excavation work. Rubble was encountered as backfill in portions of the basements of the former buildings, apparently a result of when the former buildings on the Subject Site were demolished. Concrete rubble was also excavated as floor slabs were removed, building footings were excavated, and other foundation elements such as pile caps, basement walls, grade beams, etc., were encountered and removed.

Rubble excavated from any of these sources was initially surveyed for radioactivity. If radioactivity was measured above the cleanup threshold, the rubble was broomed clean to remove adhering soil, and the rubble was resurveyed. In most cases the material could be decontaminated by removal of the adhering soil. In relatively few instances, rubble material could not be decontaminated, either by broom cleaning or by water pressure and brushing. In those instances the rubble was loaded for disposal as radiologically impacted.

The rubble that was frisked as clean was temporarily stockpiled on the Subject Site. The stockpiles were covered with tarps to minimize potential wind generation of dust from adhering soil. The material was loaded for off-site disposal as necessary to manage traffic on the Subject Site.

At two locations, concrete was allowed to remain below grade. Near the north edge of the Subject Site, a concrete wall was encountered along the east-west oriented grid line at M.5 from approximately grid line 13.5 to 15.5. This location lies in an area where USEPA agreed that the soils did not require removal, based on the results of the perimeter drilling investigation, and this wall was not removed. In addition, along the east edge of the Subject Site, several large foundation elements were found to extend an estimated 8 feet below the water table. These elements appear to be pile caps from a building that pre-dated the building constructed on the Subject Site in 1917, and therefore would have pre-dated the Lindsay Light operations. The evidence that the foundation elements pre-dated the 1917 building was that the floor slab for the 1917 building was constructed above these pile caps and showed no evidence of utilizing them in the support for the 1917 building. In addition, an excavation was performed below one of the pile caps and the underlying soil was observed to consist of the native beach sand and not the urban fill. Figure 8 provides the locations of the foundation elements that were left in place at the east end of the Subject Site. STS requested and obtained USEPA approval that these remaining pile caps could be left in place at the Subject Site.

## **2.8 USEPA Verification Sampling**

USEPA provided radiological verification surveys and sampling at several stages in the excavation work. In Phase I, each radiological exclusion zone required release through a verification survey and sampling effort. In Phase II, verification surveys and sampling were required for each exclusion zone and as part of the final Phase II sign-off upon removal of the fill materials. USEPA also provided sign-off on the verification sampling of the pesticide removal activities conducted by STS; however, USEPA did not collect separate samples for pesticide verification. A summary of the verification sampling and analyses is provided in the following sections.

### **2.8.1 On-Site NUTRANL Laboratory, Documentation of Equivalent to Off-Site Laboratory and USEPA Contract Laboratory**

The verification of the completion of radiological removal work proceeded in several steps. A pre-verification survey and sampling was conducted by STS. The samples were analyzed at the on-site laboratory using the NUTRANL system. When those surveys and analyses showed the locations to be below the cleanup threshold, USEPA was notified. A verification survey and sampling were then conducted by USEPA, and the samples were initially analyzed at the field laboratory using the NUTRANL system.

In order to provide confidence that the field laboratory would generate reliable data, a series of 6 samples were analyzed at the field laboratory and at a fixed laboratory (RSSI of Morton Grove, Illinois). The

samples used were samples previously analyzed at both the NUTRANL facility at the field laboratory established for the Lindsay Light II North Columbus Drive/OU3 site, and at the fixed laboratory. The samples were also provided to USEPA and the results will be included upon receipt from USEPA. Those results will be included in Appendix O, reserved for those data.

The analyses matched very well with the previous analyses, generally with less than 10 percent variation between the previous analyses and the current analyses. These are within the quality assurance standards for this project. The comparison of analyses is included in Appendix G.

### **2.8.2 Phase I**

As noted above, Phase I radiological verification by USEPA is conducted following pre-verification surveys and sampling by STS. The exclusion zones were subdivided by STS where necessary into areas no greater than 100 square meters for the pre-verification and verification surveys. A composite sample was taken from five spots within each 100 square meter area, and after homogenization and screening to remove materials greater than ¼ inch, a sample consisting of five 20-gram sub-samples, each in a 20 milliliter vial, for a total sample of 100 grams, was taken. These sub-samples were then analyzed at the on-site laboratory and if all sub-samples passed, the Notification of Successful Verification Sampling Form was filled out by STS, the results were attached and the form and results were transmitted to USEPA. USEPA would review the results and on the basis of the results sign and return the Notification of Successful Verification Sampling Form. The samples were subsequently provided to USEPA under chain of custody and transmitted to its subcontract laboratory for confirmation analysis. Results of those analyses have not been provided by USEPA. However, the verification based on the NUTRANL analyses was sufficient to proceed with release of the exclusion zones. Copies of the Notification of Successful Verification Sampling Forms – Radiological signed by USEPA are included in Appendix E.

### **2.8.3 Phase II**

There were two separate verifications performed by USEPA as part of the Phase II radiological effort. In those areas where radiologically impacted soil was encountered, a pre-verification and verification sequence was performed as under Phase I. Copies of those sign-off forms are also included in Appendix E.

Additionally, under Phase II, the entire footprint of the Subject Site was surveyed and subject to verification sampling. As the 18-inch lift surveys exposed the native sand soil and the pre-verification results showed the material to be below the cleanup threshold, as with Phase I, USEPA was notified, and

the areas were surveyed and sampled. The principal difference in Phase I and Phase II was that the Phase I work was restricted to locations previously documented to be radiologically-impacted. The Phase II verification was for the purpose of documenting that the entire Subject Site was free of radiological impacts. Copies of the verification forms for Phase II are also provided in Appendix E.

#### **2.8.4 Pesticide Area**

Pesticide-impacted materials were removed initially from the areas found to be impacted by pesticides evident in the field testing. Field tests were conducted using immunoassay test kits (Enviroguard) at the locations shown on Figure 6. The test kits were set up to provide a measurement of whether the pesticide concentration was above or below the cleanup threshold. Note the cleanup threshold included values for a variety of pesticide compounds detected at the Subject Site. The immunoassay test results did not determine individual pesticide concentrations but a range of compounds characteristic of the chlordane group of pesticides. As a general threshold, the cleanup standard for the field tests was set at 1.8 parts per million, chlordane, which is the Illinois Environmental Protection Agency's Tiered Approach to Corrective Action Objectives (TACO) Tier 1 Residential limit for soil ingestion for chlordane.

Upon reaching the apparent clean limits based on the field testing, samples were taken of the floors, one composite sample for every 100 square meters, and the walls of the excavation, one sample for every 10 linear meters. These samples were initially analyzed using the immunoassay test kits. The samples were then submitted to Severn Trent Laboratories, Inc. (STL) of St. Louis, Missouri, for verification analysis. Upon receipt of the analytical results from STL, the results and a Notification of Successful Pesticide Verification Form were forwarded to USEPA. USEPA reviewed and signed off on the results. No separate verification sampling was conducted by USEPA for the pesticide verification. Copies of the USEPA sign-off forms for the pesticide removal are provided in Appendix F.

#### **2.9 Dust Control Measures**

Dust control was a significant effort in controlling potential worker and public exposure during the excavation work. The following measures were taken in order to provide adequate dust control. The combination of these efforts resulted in no exceedances of air monitoring standards for radionuclides during the project. Air monitoring is discussed in Section 5.3, and the results are presented in Appendix J.

### **2.9.1 Pavement Cover**

The Subject Site was initially entirely paved, and as such had virtually no dust potential. As the excavation work progressed, increasingly large portions of the Subject Site had to have the pavement removed. An effort was made to limit the pavement removal to those areas that were subject to immediate removal of the radiologically impacted material. This effort continued throughout the excavation work. The pavement was not removed from Areas 2, 3, or 4 until those areas were ready to be excavated.

### **2.9.2 Minimize Traffic and Maintain Slow Speeds**

Traffic speeds were kept as low as practical on the Subject Site for safety reasons and to minimize dust generation. Traffic was limited to the trucks transporting soil and concrete rubble off site, and to the excavating equipment on the Subject Site. Personal vehicles were not used for travel on the Subject Site. Traffic speeds were kept to 10 miles per hour or less.

### **2.9.3 Water Work Days and Weekends, Street Sweeping**

Water was used as dust control throughout the work day. The pavement and exposed soil were watered as needed to minimize fugitive dust. In traffic areas, during the work day, care was taken to keep the pavement from becoming too muddy and promoting the tracking of mud off the Subject Site. As needed, street sweeping (utilizing water) was used on adjacent streets and on the paved areas on the Subject Site to reduce mud and dust potential. Additionally, once daily during weekends, the Subject Site was watered to reduce potential dust generation from wind.

### **2.9.4 Tarp All Soil Piles**

No radiologically or pesticide impacted soil was stored in stockpiles on the Subject Site. However, due to the apparent perception among some of the members in the surrounding community that dust from the Subject Site might be contaminated and that fugitive dust might create a nuisance to the vicinity public, stockpiles of radiologically-cleared materials were covered to minimize the potential for dust generation. These stockpiles included the asphalt and sub-base gravel removed when the pavement was stripped, the concrete rubble removed and surveyed as clean, and the overburden soil that was found not to be impacted by radiological materials or pesticides above the stipulated cleanup levels and that was staged for subsequent use as fill on the Subject Site.

### **2.9.5 Drape Covers Over Exposed Radiological Excavation Surfaces**

During the course of some operations, such as the removal of the pesticide impacted soil, some excavation faces that exposed radiologically impacted soil remained exposed overnight and in some cases over weekends. To minimize potential for those soils to become windborne, exposed surfaces where radiological soils remained were covered with a plastic drape. These drape covers were weighted at the bottom and top to minimize the potential for their blowing in the wind.

### **2.9.6 Untarped Trucks**

On August 8, 2002, it was reported to the Project Coordinator at a meeting with USEPA, Chicago Department of Environment and local citizens, that perhaps two trucks leaving the site on one specific day had not been completely covered with tarps. This was not in compliance with the Work Plan Dust Control Plan and inquiries were subsequently made regarding this issue. The trucking contractor reported that the concrete debris being hauled off-site at the time of the untarped loads had reinforcing steel protruding which prevented the tarps from being deployed. The drivers reportedly did not notify site personnel but proceeded off-site.

While the material had been surveyed and found to be clean before being stockpiled or loaded for transport, the Work Plan Dust Control Plan specified all trucks would be covered. The contractor's Superintendent and Field Team Leader were required to confirm all subsequent trucks were covered following this incident report. No further incidents involving untarped trucks were noted during the remainder of the project. There was no release of impacted material that occurred as a result of this isolated incident.

### **2.9.7 Helicopter Incident**

USEPA informed TRS of an incident involving a helicopter in the vicinity of the Subject Site. Specifically, USEPA reported that on the morning of Sunday, November 4, 2001, a helicopter was observed hovering approximately eight feet over the site. Upon further investigation, it was determined that the helicopter was being used by a contractor involved in construction on an adjacent site. The presence of the helicopter at the Subject Site was done without permission or knowledge of TRS.

USEPA was concerned that the helicopter incident may have caused dispersal of impacted dust at the Subject Site. At the time of the helicopter incident, the perimeter drilling program (Section 2.1) had recently been completed and resulted in the presence of small piles of drill cuttings (soil) at approximately

380 locations around the perimeter of the site. These cuttings and the borings from which they came had been screened for radioactivity as the borings were drilled. The few borings which exhibited elevated radioactivity had the cuttings placed in containers for disposal. No contaminated cuttings remained at the site when the helicopter incident occurred.

In an effort to document that no radioactivity had been dispersed at the site, four soil samples were collected from the gutters at the southeast margins of the site. Those samples were analyzed by gamma spectroscopy at RSSI in Morton Grove, Illinois. All samples were less than 1 pCi/g total radium.

Additionally, to minimize potential for future dust generation, the soil cuttings were collected and placed in a 10 yard roll-off box and tarped with plastic.

## **2.10 Work Plan Changes**

During the performance of the excavation work, several changes were made to the Work Plan. For these changes, a request for the change was made to USEPA and its concurrence was received. This correspondence regarding these Work Plan changes is included in Appendix C. The specific changes are discussed in the following paragraphs.

### **2.10.1 Revise Sequence for Phase I/II in Each Area**

The Work Plan, in the form approved by USEPA before commencement of the excavation work, provided that the Phase I work would be completed in all of the Areas 1, 2, 3 and 4 before commencing Phase II work in any such Area. As the excavation progressed, it became apparent that it would be beneficial to complete both Phase I and Phase II work in Area 1 before proceeding into the other Areas. This was due to the large size of Area 1 relative to the other Areas and the benefit of using a completed Area 1 for equipment storage and material staging. Completion of Phase I and Phase II in Area 1 would also allow an access road to be built on fill placed in Area 1 to improve access to portions of Area 1. Further, the completion of Phases I and II in Area 1 before beginning pavement removal in Areas 2, 3 and 4 would help manage the potential dust issue. Requests for USEPA's approval of this change in the sequence of the excavation work in Area 1 were submitted to USEPA in STS's letters dated June 25 and July 8, 2002. Approval for these changes was received from USEPA in its letter dated July 18, 2002.

A similar request was also made August 16, 2002 with regard to sequence of Phase I and Phase II in Areas 2, 3 and 4. Approval for that change was received from USEPA in its letter dated August 22, 2002.

### **2.10.2 Slope Soil Remaining Unexcavated Outside Concrete Wall**

The purpose of the perimeter drilling program was to achieve radiological clearance of a wedge of soil around the north, east and south perimeters of the Subject Site by downhole logging of soil borings in those perimeter areas rather than by screening such soils in 18 inch lifts as in other portions of the Subject Site. This perimeter drilling program avoided the necessity of installing an earth retention system which would have been required to protect surrounding sidewalks and streets from collapse if the excavation had extended vertically to native sands at the property line in those perimeter areas. Along the north edge of the Subject Site at line M.5, from stations 13.5 to 15.5, a concrete wall was encountered within approximately 3 feet of the edge of the Subject Site. The proximity of the wall to the edge of the Subject Site made excavating on the outside of the wall impractical. It would be necessary to remove the wall in order to remove a small wedge of soil at the top of the slope into the Subject Site. The soil in question was within the volume of soil investigated as part of the perimeter drilling and logging program. In the area in question, no evidence of impacted soil was noted. As a result, it was requested that this wall, and the soil on the outside of the wall, be allowed to remain in place.

Requests for this Work Plan change were submitted to USEPA in STS's letters dated September 27 and October 8, 2002. Approval of the change was received from USEPA in its letter dated October 15, 2002.

### **2.10.3 Concrete Foundations Remaining**

Most concrete foundation elements and floors and walls were removed from the Subject Site. At the east end of the Subject Site, deep foundation elements were encountered, apparently pile caps for a building formerly at this location. These concrete blocks were fairly massive and extended below the water table approximately 8 feet. Inspection of these features showed that they pre-dated the building that was constructed on the Subject Site in 1917. They were constructed so as to be embedded in the native sand soil found elsewhere beneath the Subject Site, and found to have no radiological impacts. One pile cap was removed to the top of the wood piles and no evidence of radiologically-impacted material was found beneath this pile cap. Additionally, no evidence of radiological impact was found in fill soil excavated in the vicinity of these features. In that their construction pre-dated the Lindsay Light operations in this area, approximately 1915 to 1936, there is no evidence of radiological impacts in the surrounding fill, and the features are embedded in the native sand found elsewhere on the Subject Site to be free of radiological impacts, it was requested that they be allowed to stay in place.

Request for this Work Plan change was submitted to USEPA in STS's letters dated September 27 and October 8, 2002. Approval of the change was received from USEPA in its letter dated October 15, 2002.



#### **2.10.4 No Dewatering**

It was anticipated that the excavation for screening the fill soil at some portions of the Subject Site would require excavation to depths below the water table. In preparation for this eventuality, application for discharge of dewatering effluent was made to the Metropolitan Water Reclamation District of Greater Chicago (MWRDGC). Approval for discharge of dewatering effluent was received, and permits were to be applied for from the Chicago Sewer Department when the dewatering was to be implemented.

As the excavation proceeded, it became evident that, because of the limited depths excavated in order to complete the radiological survey work, dewatering was not required. No change to the Work Plan was requested by STS or approved by USEPA; however, this change is reported herein as a variation from the Work Plan as approved by USEPA.

#### **2.11 Impacted Materials Remaining Off-Site Beneath Sidewalk**

The excavation work resulted in removing all radiologically-impacted material from within the limits of the Subject Site. Several locations were cleaned to the property line with material noted in the excavation sidewall extending underneath the adjacent sidewalk. Figure 9 shows the locations for material off-site under the sidewalk. Analytical results for samples obtained from those locations are included in Appendix G.

Additionally, a walkover survey of the sidewalks over these locations was completed in cooperation with USEPA on October 29, 2002. A microR meter survey measured for elevated radiation exposure from the material present beneath the sidewalk. No readings above background levels were detected. The data from the microR survey are included in Appendix H.

#### **2.12 Restoration of the Subject Site**

Restoration of the Subject Site following the completion of the excavation work consisted of three principal efforts: (a) the Subject Site was rough graded, (b) a gravel cap was installed, and (c) a chain link fence was installed around the north, east and south sides of the Subject Site (no fence was necessary on the west side because of the Time-Life Building immediately adjacent to the Subject Site on the west). USEPA correspondence indicating its concurrence with this restoration work is included as Appendix I.

The rough grading was completed to flatten the slopes to the extent practical to minimize the likelihood of erosion of the soil remaining. Grading covered the vertical cuts at the site margins where radiologically-impacted materials remain at the Subject Site perimeter, extending beneath the adjacent sidewalk. Additionally, the grading covered the concrete foundation elements left at the eastern end of the Subject Site. Grading attempted to minimize the low areas resulting from the removal from the Subject Site of the radiologically-impacted material, the pesticide impacted material, and the concrete rubble. While some low spots remain, the soil is generally permeable enough to provide for infiltration of precipitation. The fill soil was not subject to any engineered compaction specifications in the course of the rough grading or other restoration work.

A gravel cap was installed over the entire Subject Site. The principal objectives of the gravel cap were to prevent erosion of the Subject Site and to control wind-generated dust. A cap on the order of 2 inches thick was spread following the rough grading of the Subject Site.

A perimeter fence was installed. The fence was provided with two vehicle gates and two pedestrian access gates. The temporary construction fence was not removed until the installed fence was completed to provide for uninterrupted site security. The installed fence will remain locked except when access is needed.

### **3.0 QUANTITIES OF MATERIALS REMOVED**

Three types of materials were removed from the Subject Site during the Removal Action: (a) radiologically-impacted soils containing radioactivity in excess of USEPA's cleanup criteria of 7.1 pCi/g total radium, (b) non-radiological pesticide-impacted soils (i.e., not containing radioactivity in excess of USEPA's cleanup criteria but containing pesticide concentrations over the USEPA-approved pesticide cleanup criteria), and (c) concrete rubble. The material remaining on the Subject Site was found to not require off-site transport and disposal. The following sections document the quantities removed and the locations to which the material was transported.

#### **3.1 Radiologically-Impacted Soil**

Radiologically-impacted soil was loaded into shipping containers for transport to and disposal at EnviroCare of Utah, Inc. located in Clive, Utah. The initial containers were shipped and quantities assigned on the basis of weights determined from previous containers that were weighed during transportation. A scale was brought to the Subject Site on July 17, 2002 and the majority of the containers were weighed. When the excavation work moved into Area 4, the scale was demobilized and the remaining containers assigned weights based on the previous shipments. On the basis of the estimated weights based on weighed containers from previous shipments, and the weighed containers, a total of 285 containers containing a total of 6,233 tons was shipped from the Subject Site to the EnviroCare of Utah, Inc. disposal facility in Clive, Utah. Of these 285 containers, 49 exhibited sufficient radioactivity through the shipping container to require DOT placarding as part of the shipping papers. Copies of the manifests related to those shipments to EnviroCare of Utah, Inc. are included in Appendix N.

#### **3.2 Non-Radiological Pesticide-Impacted Soil**

Non-radiological pesticide-impacted soil was loaded into covered semi-trailers and transported to CID Landfill in Calumet City, Illinois. The material was loaded to an approximate quantity by cubic yard, and weighed upon receipt at the landfill. On the basis of the weigh tickets at the receiving landfill, a total of 315 truckloads containing a total of approximately 5,689 tons of non-radiological pesticide impacted soil were disposed at CID Landfill in Calumet City, Illinois.

### **3.3 Concrete Rubble**

Concrete rubble was generated in the course of excavations of floor slabs, basement walls and foundation elements on the Subject Site. It was initially proposed to contain these materials on the Subject Site as non-contaminated materials. However, greater than anticipated volumes were encountered and it became apparent that the accumulation of this material would constrain traffic and would eventually require multiple handlings to provide access to the entire Subject Site. As a result, the material was transported off-site for disposal as clean fill. The material was measured by the receiving site, Vulcan Materials at 39<sup>th</sup> and Racine, Chicago, Illinois. The quantity delivered was 2,670 cubic yards.

## **4.0 DIFFICULTIES ENCOUNTERED**

### **4.1 Volume of Concrete Footings and Foundation Walls Exceed Expectations**

As noted above, considerably more concrete debris was encountered than anticipated. The removal involved the segregation of this material, frisking and surveying for elevated radioactivity, decontamination as necessary, and temporary staging in piles on the Subject Site. Where steel rebar protruded from the concrete, that rebar had to be cut off. To comply with dust control efforts, these staged piles were covered with tarps. When sufficient volume had accumulated to facilitate an efficient removal, trucks were mobilized to transport the concrete to a clean fill disposal site. This quantity of material increased costs and slowed progress on the project.

### **4.2 Pesticide Impacts Extend Beyond Originally Inferred Impacted Area**

The extent of the pesticide impacted soil was estimated based upon drilling and sampling as reported in the STS report dated February 25, 2002. That report did not determine the limits to the north and east. However, the extent was estimated to be limited to the locations initially detected. Upon removal of the radiologically-impacted soil, samples were taken in a series of test pits to document the limit of the pesticide impacts. The removal extended to the limits of those impacts, which were considerably farther than initially estimated. The confirmation sampling and analysis conducted to verify the cleanup levels had been reached required submittal to an off-site laboratory, and several day turnaround caused some delays in closing out certain portions of the Subject Site. The larger than estimated quantity of impacted material resulted in additional expense and extended the schedule to remove this additional material.

### **4.3 Radiologically-Impacted Materials Beneath the Adjacent Sidewalks**

In the course of removal of radiologically-impacted soil, several locations were found that exhibited impacts beneath the City of Chicago sidewalks adjacent to but outside the boundaries of the Subject Site. Those locations and the level of radiological activity found are show on Figure 9. TRS did not remove this impacted material as it was not within the legal boundaries of the Subject Site.

## **5.0 ANALYTICAL RESULTS**

### **5.1 Soil Sample Radiological Analytical Results**

#### **5.1.1 Progress Excavation Soil Samples**

Soil samples were collected and submitted for NUTRANL analysis to document the concentrations of the target cleanup radionuclides in the material being excavated. Samples in this group of samples ranged from materials below cleanup levels to materials well above the cleanup threshold. The maximum activity measured using the NUTRANL system was 10,116 pCi/g total radium. These progress evaluation soil samples were used as a confirmation of the field survey results. These samples were collected throughout the progress of the Phase I and Phase II excavation work. The NUTRANL analysis samples are presented in Appendix G, first by laboratory number, which is also a chronological catalogue, and by location coordinate.

#### **5.1.2 USEPA In-Growth Assessment Sample Series**

The USEPA requested that a series of samples be collected and analyses conducted over a period of 28 days to assess the impact of in-growth of radiological daughter products on measured radiation. These samples were then transmitted to USEPA under chain-of-custody. The results are provided as a separate part of Appendix G.

#### **5.1.3 Overburden Samples**

In accordance with SOP-214, overburden materials that are to be used for backfill are to be analyzed to confirm that the levels of radioactivity meet the USEPA cleanup criteria of 7.1 pCi/g total radium. The overburden samples from the Subject Site were analyzed and the results are presented in Appendix G.

#### **5.1.4 Pre-Verification Samples**

The process of verification of exclusion zones under Phase I and Phase II, and the final verification under Phase II involved the collection and analysis of pre-verification samples to confirm that the removal had reached the cleanup levels. These samples were collected and analyzed before notifying USEPA to conduct its verification surveys and sampling. The results from analysis of these pre-verification samples are presented in Appendix G.

### **5.1.5 USEPA Verification Samples**

USEPA collected verification samples on each Phase I and Phase II radiological exclusion zone, and on each grid of the Phase II final excavation. These samples were composites of five locations for each area to a maximum of 100 square meters. The five samples forming the composite from each area were then homogenized and five sub-samples were prepared. The sub-samples were analyzed using the NUTRANL on-site laboratory. The analytical results for these sub-samples were used to verify the cleanup levels had been met, and the closure of each area was then signed-off by USEPA. The results for these USEPA verification samples are included in Appendix G. The samples were transferred to USEPA under chain-of-custody for analysis at its contract laboratory. No results from those analyses have been provided to STS.

### **5.1.6 Off-Site Laboratory Gamma Spectroscopy Results**

Off-site laboratory analyses were provided on approximately 5 percent of the verification samples. These analyses were provided through RSSI of Morton Grove, Illinois. The analyses were by gamma spectroscopy, and were performed using the 71 percent Gamma Fraction Limit and 1.2 Library Energy Tolerance per USEPA specifications. These analyses are included in Appendix G.

## **5.2 Soil Sample Pesticide Results**

### **5.2.1 Field Immunoassay Samples**

Field testing for pesticides used immunoassay tests by Enviroguard. These field tests did not measure concentrations of individual pesticides but rather the group of chlordane and associated compounds. The testing was conducted so as to indicate whether the samples were approximately above or below the TACO Tier 1 Residential ingestion clean-up level of 1.8 parts per million for chlordane. The analytic field testing data presented in Appendix G, therefore, is not intended to accurately describe the concentrations present. Rather these analyses indicated whether or not the soil sample exceeded the clean-up threshold for chlordane. Actual laboratory measurements of individual pesticide concentrations are discussed in the following section.

### **5.2.2 Off-Site Laboratory Verification Samples**

The verification samples for the pesticide removal were submitted for analysis to Severn Trent Laboratories, Inc. of St. Louis, Missouri. These analyses provided results on the concentrations of

specific pesticide compounds, and were used to document whether the removal had achieved the specified cleanup level. Several verification results were found to exceed the cleanup level, and additional removal was required before the subsequent verification samples documented a clean closure at that location. All areas identified as pesticide-impacted were eventually documented as meeting the cleanup criteria. The laboratory results are provided in Appendix G.

### **5.3 Air Monitoring Analytical Results**

#### **5.3.1 Site Perimeter Air Monitoring**

Site perimeter air monitoring for airborne radioactivity was required whenever excavation work was being conducted. Sampling for this air monitoring occurred at approximately the mid-point of each side of the Subject Site, north, south, east and west. Figure 10 shows the locations of the perimeter air monitoring equipment. Note that the locations were occasionally moved due to the presence of an obstruction such as a parked truck or container that would have potentially blocked the air flow to the monitoring equipment.

The air samples were analyzed the day after collection and again after four days to allow for short lived daughters to decay. At no time were effluent air concentrations at the site perimeter found to exceed the limits specified in Title 10, Part 20, Appendix B, Table 2, Column 1 of the Code of Federal Regulations (CFR). Additionally, no exceedances of 30% of the Derived Air Concentration (DAC) were documented for any day of operation. No exceedances of 30% of the Derived Air Concentration (DAC) were documented for any day of operation. Perimeter air monitoring results are provided in Appendix J.

#### **5.3.2 Personal Air Monitoring**

Personal air monitoring (PAM) data for radioactivity for both one-day and four-day analyses are included in Appendix J. These data show no exceedances of the allowable exposure limits for this project per Title 10, Part 20, Appendix B, Table 1, Column 3 of the CFR. No worker monitoring showed any levels that approach or exceed the occupational limit of the total Effective Dose Equivalent of 5 rem/year. Note that additional personal monitoring results are provided in Section 5.6, regarding personnel radiation badge results.



## **5.4 Field Gamma Survey Results**

### **5.4.1 Phase I Exclusion Zones**

The entire Subject Site was surveyed for elevated gamma radiation as the asphalt and concrete pavement and floor slabs were removed from the Subject Site. Exclusion zones were established in any areas where gamma readings indicated an exceedance of the 7.1 pCi/g threshold. Appendix K presents the field gamma survey sheets for the Phase I survey of the Subject Site as pavement stripping occurred. The survey sheets are subdivided into Areas 1, 2, 3 and 4, as this was the way the Subject Site was surveyed. The exclusion zones identified in these Phase I surveys are also shown on Figure 5.

### **5.4.2 Phase II Lift Surveys**

Surveying conducted during Phase II provided data of gamma readings as the Subject Site was excavated in 18 inch lifts through the fill soil to the underlying native soil. As a result, there are some locations where there are several survey sheets for the same location, and these sheets are designated by the various numbers of excavation lifts at that location. In other places where the impacted material removed from the exclusion zone extended to the native soil, no survey of excavation lifts was conducted as part of Phase II. As with the Phase I surveys, the survey data are divided into Areas 1, 2, 3 and 4 as this was the order that the surveys were conducted. These data are presented in Appendix K.

## **5.5 Equipment Release Surveys**

Equipment that operated within exclusion zones required a frisking and wipe survey to document the equipment was free of contamination before that equipment could be released for unrestricted use in accordance with SOP-345. The principal equipment operating in the exclusion zones was the excavator. The analyses for the wipe surveys of the equipment are included in Appendix L.

## **5.6 Personnel Radiation Badge Results**

Personnel operating in the exclusion zones, assisting with the loading of the containers, and other persons potentially in contact with radiologically impacted material were monitored with Optically Stimulated Luminescence (OSL) film badges. Badges were changed each calendar month. No exceedances of the allowable exposures were measured for any personnel on this project. The results of the film badge monitoring are presented in Appendix M.

## **6.0 CONCLUSION**

### **6.1 Work Completed in Accordance With Work Plan**

The work at the Subject Site has been completed in accordance with the Work Plan in the form approved by USEPA, as modified with USEPA's approval. As previously indicated, the Work Plan did not specifically address radiologically-impacted materials located under the City of Chicago's sidewalk right-of-ways immediately adjacent to but outside the boundaries of the Subject Site, and as a result, radiologically-impacted materials remain under the adjacent sidewalks.

### **6.2 No Radiologically or Pesticide Impacted Material Remains**

The work completed at the Subject Site included obtaining verification sign-off from USEPA for surveys of the entire Subject Site for radiological impacts. Additionally, verification sign-off was obtained from USEPA with regard to the removal of the pesticide impacted soils at the Subject Site. As a result, there are no radiologically or pesticide impacted materials remaining on the Subject Site in excess of the cleanup criteria stipulated in the Work Plan.

There are however, remaining radiologically-impacted materials beneath the immediately adjacent sidewalks and there are restrictions on the access to those materials during the installation and maintenance of utilities and other activities that expose the impacted subsurface soils. In addition, precautions must be taken to prevent exposure of on-site workers should this impacted material be revealed during construction, maintenance or other activities that may expose on-site workers to the immediately adjacent off-site impacted material.

### **6.3 Request Notice of Completion**

On the basis of the Removal Action being completed in accordance with the Work Plan approved by USEPA, and the verification by USEPA that no radiologically or pesticide impacted material remains in excess of the cleanup criteria stipulated in the Work Plan, STS, on behalf of TRS, requests that USEPA issue a Notice of Completion pursuant to Article XII of the UAO confirming that (a) all radiologically-impacted materials and pesticide-impacted materials with levels of radioactivity and pesticides in excess of the cleanup standards set forth in the Work Plan have been removed from the Subject Site as required by the Work Plan and the UAO, (b) no further investigation, removal or cleanup action is required at the Subject Site with respect to radiologically-impacted materials and pesticide-impacted materials, and (c)

construction and development work on the Subject Site may proceed without further regulatory requirements relating to radiological impacts or pesticide impacts.



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## APPENDIX O

### USEPA Analytical Results



## 1 TRS Soil Verification Data

## STS/Huber Data

## EPA NAREL Data

Sample ID	Sample Date	Site Location	Th-232 (pCi/g)	Ra-226 (pCi/g)	Total Radium (pCi/g)	Mean Radium (pCi/g)
89	6/11/02	B-8.5	2.12	1.86	3.98	
90	6/11/02	B-8.5	4.44	2.98	7.42	
91	6/11/02	B-8.5	1.14	2.43	3.57	
92	6/11/02	B-8.5	1.58	2.43	4.01	
93	6/11/02	B-8.5	1.33	1.68	3.01	4.40
94	6/11/02	A-B/2-6	2.24	3.25	5.49	
95	6/11/02	A-B/2-6	1.8	3.17	4.97	
96	6/11/02	A-B/2-6	3.44	2.69	6.13	
97	6/11/02	A-B/2-6	2.11	3.26	5.37	
98	6/11/02	A-B/2-6	1.74	2.75	4.49	5.29
158	6/18/02	B-C/2-6	2.79	2.41	5.20	
159	6/18/02	B-C/2-6	1.42	3.11	4.53	
160	6/18/02	B-C/2-6	2.58	2.69	5.27	
161	6/18/02	B-C/2-6	1.57	3.13	4.70	
162	6/18/02	B-C/2-6	1.83	4.16	5.99	5.14
240	6/24/02	D-E/6-9	1.17	2.26	3.43	
241	6/24/02	D-E/6-9	2.18	0.84	3.02	
242	6/24/02	D-E/6-9	1.86	1.10	2.96	
243	6/24/02	D-E/6-9	1.33	2.51	3.84	
244	6/24/02	D-E/6-9	1.85	0.07	1.92	3.03
245	6/24/02	C-D/6-9	1.67	3.01	4.68	
246	6/24/02	C-D/6-9	1.29	1.04	2.33	
247	6/24/02	C-D/6-9	1.10	2.29	3.39	
248	6/24/02	C-D/6-9	0.74	1.99	2.73	
249	6/24/02	C-D/6-9	12.39	1.19	13.58	5.34
250	6/24/02	C-D/2-6	2.19	2.23	4.42	
251	6/24/02	C-D/2-6	1.46	1.70	3.16	
252	6/24/02	C-D/2-6	2.00	0.84	2.84	
253	6/24/02	C-D/2-6	2.06	1.36	3.42	
254	6/24/02	C-D/2-6	2.58	1.21	3.79	3.53
257	6/24/02	B-C/6-9	1.71	1.88	3.59	
258	6/24/02	B-C/6-9	1.75	2.08	3.83	
259	6/24/02	B-C/6-9	-0.09	3.41	3.32	
260	6/24/02	B-C/6-9	1.16	0.40	1.56	
261	6/24/02	B-C/6-9	2.27	1.00	3.27	3.11
262	6/24/02	D-E/2-6	1.05	2.66	3.71	
263	6/24/02	D-E/2-6	0.83	1.94	2.77	
264	6/24/02	D-E/2-6	0.76	2.00	2.76	
265	6/24/02	D-E/2-6	0.97	2.01	2.98	
266	6/24/02	D-E/2-6	3.47	2.79	6.26	3.70

Th-232 (pCi/g)	Ra-226 (pCi/g)	Total Radium (pCi/g)
1.91	0.908	2.82
2.54	1.95	4.49
1.77	2.43	4.20
1.18	1.03	2.21
1.21	1.01	2.22
1.52	0.824	2.34
1.35	1.08	2.43
1.00	0.776	1.78
1.33	0.920	2.25

DUP

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Sample ID	Sample Date	Site Location	Th-232 (pCi/g)	Ra-226 (pCi/g)	Total Radium (pCi/g)	Mean Radium (pCi/g)
394	7/8/02	A.5-D/15.5-17.5	1.60	2.39	3.99	
395	7/8/02	A.5-D/15.5-17.5	1.86	2.34	4.20	
396	7/8/02	A.5-D/15.5-17.5	2.46	2.31	4.77	
397	7/8/02	A.5-D/15.5-17.5	1.51	2.49	4.00	
398	7/8/02	A.5-D/15.5-17.5	1.80	3.19	4.99	4.39
399	7/8/02	A.5-D.5/14-15.5	0.92	1.82	2.74	
400	7/8/02	A.5-D.5/14-15.5	1.60	0.81	2.41	
401	7/8/02	A.5-D.5/14-15.5	-0.44	3.49	3.05	
402	7/8/02	A.5-D.5/14-15.5	0.34	2.24	2.58	
403	7/8/02	A.5-D.5/14-15.5	1.34	1.40	2.74	2.70
404	7/8/02	B-C/9-13	0.59	2.81	3.40	
405	7/8/02	B-C/9-13	1.48	2.01	3.49	
406	7/8/02	B-C/9-13	1.24	1.67	2.91	
407	7/8/02	B-C/9-13	1.77	0.65	2.42	
408	7/8/02	B-C/9-13	1.38	1.88	3.26	3.10
409	7/8/02	A.5-E/13-14	0.26	1.16	1.42	
410	7/8/02	A.5-E/13-14	0.65	2.15	2.80	
411	7/8/02	A.5-E/13-14	1.03	1.09	2.12	
412	7/8/02	A.5-E/13-14	0.29	2.05	2.34	
413	7/8/02	A.5-E/13-14	1.32	0.22	1.54	2.04
414	7/8/02	C-E/9-11	2.25	3.43	5.68	
415	7/8/02	C-E/9-11	3.91	1.85	5.76	
416	7/8/02	C-E/9-11	3.11	1.06	4.17	
417	7/8/02	C-E/9-11	2.37	2.07	4.44	
418	7/8/02	C-E/9-11	3.88	2.40	6.28	5.27
419	7/8/02	C-E/11-13	1.72	3.07	4.79	
420	7/8/02	C-E/11-13	4.38	-0.12	4.26	
421	7/8/02	C-E/11-13	3.46	2.46	5.92	
422	7/8/02	C-E/11-13	2.56	1.34	3.90	
423	7/8/02	C-E/11-13	3.42	1.82	5.24	4.82
492	7/12/02	E-G/4-6	1.83	2.53	4.36	
493	7/12/02	E-G/4-6	3.16	2.38	5.54	
494	7/12/02	E-G/4-6	3.38	0.88	4.26	
495	7/12/02	E-G/4-6	4.31	2.59	6.90	
496	7/12/02	E-G/4-6	0.75	2.67	3.42	4.90

	Th-232 (pCi/g)	Ra-226 (pCi/g)	Total Radium (pCi/g)
	1.86	3.62	5.48
DUP	1.75	3.27	5.02
	0.833	1.44	2.27
	1.05	1.69	2.74
	0.762	1.50	2.26
	2.31	2.28	4.59
	2.06	1.59	3.65
	1.96	1.73	3.69



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Sample ID	Sample Date	Site Location	Th-232 (pCi/g)	Ra-226 (pCi/g)	Total Radium (pCi/g)	Mean Radium (pCi/g)
497	7/12/02	E-G/2-4	1.94	1.24	3.18	
498	7/12/02	E-G/2-4	1.53	2.35	3.88	
499	7/12/02	E-G/2-4	0.01	3.22	3.23	
500	7/12/02	E-G/2-4	1.39	1.35	2.74	
501	7/12/02	E-G/2-4	-0.25	3.06	2.81	3.17
502	7/12/02	E-G/6-8	0.79	0.59	1.38	
503	7/12/02	E-G/6-8	0.20	2.29	2.49	
504	7/12/02	E-G/6-8	1.10	1.80	2.90	
505	7/12/02	E-G/6-8	0.56	1.76	2.32	
506	7/12/02	E-G/6-8	0.62	1.17	1.79	2.18
507	7/12/02	E-G/8-10	0.99	2.91	3.90	
508	7/12/02	E-G/8-10	1.00	0.32	1.32	
509	7/12/02	E-G/8-10	0.49	2.69	3.18	
510	7/12/02	E-G/8-10	0.86	1.77	2.63	
511	7/12/02	E-G/8-10	0.88	1.20	2.08	2.62
562	7/22/02	G-1.5/8-9	0.86	1.47	2.33	
563	7/22/02	G-1.5/8-9	1.50	1.05	2.55	
564	7/22/02	G-1.5/8-9	1.32	0.90	2.22	
565	7/22/02	G-1.5/8-9	1.20	1.70	2.90	
566	7/22/02	G-1.5/8-9	1.53	1.01	2.54	2.51
567	7/22/02	G-1/9-11	2.84	0.86	3.70	
568	7/22/02	G-1/9-11	1.72	2.40	4.12	
569	7/22/02	G-1/9-11	2.02	1.57	3.59	
570	7/22/02	G-1/9-11	1.52	3.00	4.52	
571	7/22/02	G-1/9-11	1.71	2.05	3.76	3.94
572	7/22/02	G-1/11-13	0.87	2.17	3.04	
573	7/22/02	G-1/11-13	0.64	1.60	2.24	
574	7/22/02	G-1/11-13	0.33	2.67	3.00	
575	7/22/02	G-1/11-13	1.75	1.44	3.19	
576	7/22/02	G-1/11-13	0.85	1.20	2.05	2.70
577	7/22/02	G-1.5/2-4	2.86	0.23	3.09	
578	7/22/02	G-1.5/2-4	2.01	0.57	2.58	
579	7/22/02	G-1.5/2-4	1.17	1.88	3.05	
580	7/22/02	G-1.5/2-4	2.40	0.88	3.28	
581	7/22/02	G-1.5/2-4	2.03	1.93	3.96	3.19
582	7/22/02	E-G/10-12	2.27	1.36	3.63	
583	7/22/02	E-G/10-12	2.63	2.04	4.67	
584	7/22/02	E-G/10-12	1.96	2.12	4.08	
585	7/22/02	E-G/10-12	1.59	2.69	4.28	
586	7/22/02	E-G/10-12	1.57	2.95	4.52	4.24

Th-232 (pCi/g)	Ra-226 (pCi/g)	Total Radium (pCi/g)
0.976	2.48	3.46
0.713	1.21	1.92
0.846	1.95	2.80
0.687	1.08	1.77
1.13	2.21	3.34
0.804	1.54	2.34
1.28	1.72	3.00
1.11	1.94	3.05



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Sample ID	Sample Date	Site Location	Th-232 (pCi/g)	Ra-226 (pCi/g)	Total Radium (pCi/g)	Mean Radium (pCi/g)		Th-232 (pCi/g)	Ra-226 (pCi/g)	Total Radium (pCi/g)
692	8/802	A-B/15-21	0	1.37	1.37	*****	* No mean was required because samples 692-700 were single samples taken to verify sand layer was not contaminated	*****	*****	*****
693	8/802	E-G/1-3	0.67	1.68	2.35	*****		*****	*****	*****
694	8/802	G-I/1-3	0	1.53	1.53	*****		*****	*****	*****
695	8/802	G-I/3-5	0.47	0.7	1.17	*****		*****	*****	*****
696	8/802	G-I/5-7	0	1.64	1.64	*****		*****	*****	*****
697	8/802	G-I/7-9	1.55	0.72	2.27	*****		*****	*****	*****
698	8/802	G-I/9-11	1.55	0	1.55	*****		*****	*****	*****
699	8/802	G-I/11-13	0.04	0.83	0.87	*****		*****	*****	*****
700	8/802	G-I/13-15	1.05	0.5	1.55	*****		*****	*****	*****
701	8/802	G-15, clay	1.19	3.46	4.65	*****		*****	*****	*****
712	8/14/02	G-I/15-17.5	0	0.69	0.69	*****	* No mean was required because samples 712-713 were single samples taken to verify sand layer was not contaminated	*****	*****	*****
713	8/14/02	G-I/17.5-20	0.36	0.11	0.47	*****		*****	*****	*****
---						*****		*****	*****	*****
---						*****		*****	*****	*****
741	8/21/02	I-J 5/9-12	1.42	0.54	1.96					
742	8/21/02	I-J 5/9-12	0	4	4.00					
743	8/21/02	I-J 5/9-12	0.29	1.64	1.93					
744	8/21/02	I-J 5/9-12	0.95	2.19	3.14			0.773	1.08	1.85
745	8/21/02	I-J 5/9-12	0.55	1.78	2.33	2.67		0.739	1.18	1.92
746	8/21/02	E-G/11-13	0.19	0.22	0.41	*****		*****	*****	*****
747	8/21/02	E-G/13-15	0.63	0.24	0.87	*****	* No mean was required because samples 746-750 were single samples taken to verify sand layer was not contaminated	*****	*****	*****
748	8/21/02	E-G/15-17	0	3.17	3.17	*****		*****	*****	*****
749	8/21/02	E-G/17-19	1.19	0.02	1.21	*****		*****	*****	*****
750	8/21/02	E-G/19-21	0.74	1.28	2.02	*****		*****	*****	*****
760	8/26/02	I-J 5/1-4	0.05	1.78	1.83	*****		*****	*****	*****
761	8/26/02	I-J 5/4-7	0.19	0.66	0.85	*****		*****	*****	*****
762	8/26/02	I-J 5/7-9.5	0.50	0	0.50	*****		*****	*****	*****
---						*****		*****	*****	*****
763	8/26/02	I 5-K/9 5-11	0	0.96	0.96					
764	8/26/02	I 5-K/9 5-11	0.6	1.44	2.04					
765	8/26/02	I 5-K/9 5-11	0.11	2.13	2.24		* No mean was required because samples 776-785 were single samples taken to verify sand layer was not contaminated			
766	8/26/02	I 5-K/9 5-11	0.91	1.11	2.02					
767	8/26/02	I 5-K/9 5-11	0.16	1.37	1.53	1.76		0.428	0.936	1.36
776	8/30/02	J 5-I/1-4	0.57	0.91	1.48	*****		*****	*****	*****
777	8/30/02	J 5-L/4-7	1.64	0.35	1.99	*****		*****	*****	*****
778	8/30/02	J 5-L/7-9 5	0	2.85	2.85	*****		*****	*****	*****
779	8/30/02	I-L/5-11	0	1.43	1.43	*****		*****	*****	*****
780	8/30/02	C-E/10-12	0.86	0.2	1.06	*****		*****	*****	*****
781	8/30/02	C-E/12-14	0	0.29	0.29	*****		*****	*****	*****
782	8/30/02	C-E/14-16	0.63	1.21	1.84	*****		*****	*****	*****
783	8/30/02	C-E/16-18	0.23	0.27	0.50	*****		*****	*****	*****
784	8/30/02	C-E/18-20	0.36	0.65	1.01	*****		*****	*****	*****
785	8/30/02	C-E/20-21	0.15	2.96	3.11	*****		*****	*****	*****

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Sample ID	Sample Date	Site Location	Th-232 (pCi/g)	Ra-226 (pCi/g)	Total Radium (pCi/g)	Mean Radium (pCi/g)
797	9/5/02	L-L 75/5.75-6.5	1.41	1.16	2.57	
798	9/5/02	L-L 75/5.75-6.5	1.99	1.75	3.74	
799	9/5/02	L-L 75/5.75-6.5	1.75	2.59	4.34	
800	9/5/02	L-L 75/5.75-6.5	2.21	2.21	4.42	
801	9/5/02	L-L 75/5.75-6.5	2.63	1.21	3.84	3.78
802	9/5/02	I-L/11-12	0.72	0.97	1.69	*****
803	9/5/02	I-L/12-13	0.18	0.42	0.6	*****
804	9/5/02	I-L/13-14	0.83	1.33	2.16	*****
805	9/5/02	I-L/14-15	0.03	1.42	1.45	*****
806	9/5/02	I-L/15-16	0.01	2.43	2.44	*****
807	9/5/02	I-L/16-17.5	0.96	1.65	2.61	*****
808	9/5/02	I-N/1-3	0.83	1.27	2.1	*****
809	9/5/02	L-N/3-5	0	2.37	2.37	*****
829	9/11/02	L.5-N/7-9	0.29	0.67	0.96	
830	9/11/02	L.5-N/7-9	0	1.59	1.59	
831	9/11/02	L.5-N/7-9	0.16	1.32	1.48	
832	9/11/02	L.5-N/7-9	0.65	0.61	1.26	
833	9/11/02	L.5-N/7-9	0.02	1.55	1.57	1.37
834	9/11/02	L.5-N/9-10.5	0.19	0.24	0.43	
835	9/11/02	L.5-N/9-10.5	1.00	0.09	1.09	
836	9/11/02	L.5-N/9-10.5	0.26	1.78	2.04	
837	9/11/02	L.5-N/9-10.5	0	2.32	2.32	
838	9/11/02	L.5-N/9-10.5	0	1.80	1.80	1.54
839	9/11/02	L-N/5-7	1.06	0	1.06	*****
840	9/11/02	L-N/7-9	0.06	0.12	0.18	*****
841	9/11/02	L-N/9-11	0	1.13	1.13	*****
863	9/19/02	L-N/11-13	0	1.42	1.42	*****
864	9/19/02	L-N/13-15	0.32	1.66	1.98	*****
865	9/19/02	L-N/15-17	0.54	0.93	1.47	*****
866	9/19/02	L-N/17-19	0.26	0.59	0.85	*****
867	9/19/02	L-N/19-21	0	2.83	2.83	*****
868	9/19/02	I-L/17-19	0	0.44	0.44	*****
869	9/19/02	I-L/19-21	0.20	1.14	1.34	*****
870	9/19/02	I-J.5/17.5-19	0	0.33	0.33	
871	9/19/02	I-J.5/17.5-19	0	1.56	1.56	
872	9/19/02	I-J.5/17.5-19	0.48	0.72	1.2	
873	9/19/02	I-J.5/17.5-19	1.04	1.11	2.15	
874	9/19/02	I-J.5/17.5-19	0	1.07	1.07	1.26
875	9/19/02	J.5-L/17.5-19	0.49	0	0.49	
876	9/19/02	J.5-L/17.5-19	0.56	2.54	3.1	
877	9/19/02	J.5-L/17.5-19	0.82	1.35	2.17	
878	9/19/02	J.5-L/17.5-19	1.55	1.22	2.77	
879	9/19/02	J.5-L/17.5-19	0	2.92	2.92	2.29

\* No mean was required because samples 802-809 were single samples taken to verify sand layer was not contaminated

\* No mean was required because samples 839-841 were single samples taken to verify sand layer was not contaminated

\* No mean was required because samples 863-869 were single samples taken to verify sand layer was not contaminated

Th-232 (pCi/g)	Ra-226 (pCi/g)	Total Radium (pCi/g)
1.63	2.23	3.86
*****	*****	*****
*****	*****	*****
*****	*****	*****
*****	*****	*****
*****	*****	*****
*****	*****	*****
*****	*****	*****
*****	*****	*****
*****	*****	*****
*****	*****	*****
*****	*****	*****
0.264	0.567	0.83
0.217	0.644	0.86
*****	*****	*****
*****	*****	*****
*****	*****	*****
*****	*****	*****
*****	*****	*****
*****	*****	*****
*****	*****	*****
*****	*****	*****
0.292	0.507	0.80
0.498	0.728	1.23

### EPA NAREL Data

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